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प्राधिकार से प्रकाशित

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इस भाग में भिन्न पृष्ठ संख्या दी जाती है जिससे कि यह प्रस्तुत सकलम के रूप में रखा जा सके।

Separate paging is given to this Part in order that it may be filed  
as a separate compilation.

## MINISTRY OF COMMERCE

## NOTIFICATION

New Delhi, the 10th December 1968

S.O. 4463.—Whereas the Central Government is of opinion that it is necessary and expedient so to do for the development of the export trade of India that in exercise of the powers conferred by section 6 of the Export (Quality Control and Inspection) Act, 1963 (22 of 1963), automobile spares, components and accessories should be subject to quality control and inspection prior to export;

And whereas the Central Government has formulated the proposals specified below for the said purpose and has forwarded the same to the Export Inspection Council as required by sub-rule (2) of rule 11 of the Export (Quality Control and Inspection) Rules, 1964;

Now, therefore, in pursuance of the said sub-rule and in supersession of the notifications of the Government of India in the Ministry of Commerce Nos. S.O. 3224, 3225, 3226 and 3227, dated the 8th September, 1967, the Central Government hereby publishes the said proposals for the information of the public likely to be affected thereby.

2. Notice is hereby given that any person desiring to forward any objections or suggestions with respect to the said proposals may forward the same within thirty days of the date of publication of this notification in the Gazette of India to the Export Inspection Council, 'World Trade Centre', 14/1B, Ezra Street (7th floor), Calcutta-1.

## Proposals

(1) To notify that automobile spares, components and accessories shall be subject to quality control and inspection prior to export;

(2) To specify the type of inspection in accordance with the draft Export of Automobile Spares, Components and Accessories (Quality Control and Inspection) Rules, 1968, set out in Annexure III to this notification as the type of quality control and inspection which would be applied to such automobile spares, components and accessories;

(3) To recognise—

- (a) to contractual specifications as agreed upon between the buyer and the seller, subject to a minimum of the specifications given in Annexure V to this notification for the items mentioned in Annexure I to this notification; and
- (b) the company standards or the contractual specifications as agreed upon between the exporter and the buyer approved by a panel of experts appointed by the Export Inspection Council for the purpose of examining and approving such standards for the items mentioned in the Annexure II to this notification;

as the standard specifications for automobile spares, components and accessories.

(4) To prohibit the export, in the course of international trade of any such automobile spares, components and accessories, unless the same are accompanied by a certificate issued by any one of the Export Inspection Agencies established by the Central Government under section 7 of the Export (Quality Control and Inspection) Act, 1963 (22 of 1963), to the effect that the automobile spares, components and accessories satisfy the conditions relating to quality control and inspection and are export-worthy.

3. Nothing in this notification shall apply to the export of samples of automobile spares, components and accessories to prospective buyers, the F.O.B. value of which does not exceed one hundred and twenty five rupees only.

4. In this notification—

- (i) 'automobile' means any self propelled two, three or more wheeled, single or multi axled vehicle; and
- (ii) 'automobile spares, components and accessories' means the manufactured products used in automobiles and trailers (whether attached to the vehicle or not) including that used as a replacement part for the original product, given in Annexure I and Annexure II, to this notification.

**ANNEXURE I**

1. Piston pin.
2. Inlet and exhaust valves for internal combustion engines.
3. Connecting rod including its nuts and bolts.
4. Single cylinder fuel injections pump.
5. Radiator.
6. Automobile electric horn (vibrating type and wind tone type).
7. Ignition coil.
8. Starter motor and its armature (upto 24 volts D.C. only).
9. Sparking plug.
10. Automobile dynamo, its armature and field coils.
11. Headlight assembly and sealed beam light.
12. Automobile lamp (bulb).
13. Propellor shaft.
14. Axle shaft.
15. Automotive brake lining.
16. Wheel rim and disc assembly.
17. Brake drum.
18. King pin.
19. Leaf spring and its leaves
20. Shackle pin.
21. Helical spring for automobile suspension.

22. Ammeter and voltmeter.
23. Automotive hydraulic shock absorber.
24. Wiper assembly including its arm and blade.

#### ANNEXURE II

1. Piston, piston ring.
2. Valve spring.
3. Crankshaft.
4. Camshaft.
5. Rocker arm.
6. Clutch assembly, clutch plate, clutch facing and clutch spring.
7. Carburettor assembly and its components.
8. Filter element, nozzle and atomiser of fuel injection pump.
9. Water pump, fuel pump, lubricating oil pump, oil filter assembly, fuel filter assembly and their filter elements.
10. Air filter assembly and its filter elements.
11. Distributor.
12. Universal joint including its parts.
13. Brake assembly, master cylinder and wheel cylinder.
14. Oil pressure gauge, fuel gauge and speedometer.
15. Cables for speedometer, clutch and brake.
16. Gaskets of all types.
17. Oil seals of all types.
18. Transmission chains.
19. All types of bearings.
20. Automobile gears.
21. Voltage regulator.
22. Flasher unit.

#### ANNEXURE III

*Draft rules proposed to be made under section 17 of the Export (Quality Control and Inspection) Act, 1963 (22 of 1963).*

**1. Short title and commencement.**—(1) These rules may be called the Export of Automobile Spares, Components and Accessories (Quality Control and Inspection) Rules, 1968.

(2) They shall come into force at once.

**2. Definitions.**—In these rules, unless the context otherwise requires—

(a) 'Act' means the Export (Quality Control and Inspection) Act, 1963 (22 of 1963).

(b) 'Agency' means any one of the Export Inspection Agencies established at Cochin, Madras, Calcutta, Bombay and Delhi under section 7 of the Act.

(c) 'automobile' means any self propelled two, three or more wheeled, single or multi axled vehicles.

(d) 'automobile spares, components and accessories' means the manufactured products used in automobiles and trailers (whether attached to the vehicle or not) including that used as a replacement part for the original product, given in Annexure I and II to this notification.

**3. Quality Control.**—(1) The quality of the automobile spares, components and accessories intended for export shall be ensured by effecting the following controls at different stages of manufacture together with the levels of control as given in Annexure IV hereto, namely :—

(i) Bought out materials and components control—

(a) Purchase specifications shall be laid down by the manufacturer incorporating the properties of the materials/components to be used and the detailed dimensions thereof with tolerances.

(b) The accepted consignments shall be either accompanied by suppliers' test/inspection certificates corroborating the requirements of the purchase specifications, in which case occasional checks at least once in three months shall be conducted by the purchaser for a particular supplier to verify the correctness of the aforesaid test/inspection certificates, or the purchased materials/components shall be regularly inspected/tested either in a laboratory within the factory or in an outside laboratory or test house.

(c) The sampling for inspection/test to be carried shall be based on a recorded investigation.

(d) After the inspection/test is carried out systematic method shall be adopted in segregating the accepted or rejected materials/components and in disposal of rejected materials/components.

(e) Adequate records in respect of the above mentioned controls shall be maintained systematically.

**(ii) Process control—**

(a) Detailed process specifications shall be laid down by the manufacturer for different processes of manufacture.

(b) Equipment/Instrumentation facilities shall be adequate to control the processes as laid down in the process specification.

(c) Adequate records shall be maintained to ensure the verification of the controls exercised during the process of manufacture.

**(iii) Product control—**

(a) The manufacturer shall have his own adequate testing facilities or shall have access to such testing facilities existing elsewhere to test the product as per specifications recognised under section 6 of the Act.

(b) Sampling for test/inspection shall be based on a recorded investigation

(c) Adequate records in respect of test/inspection carried out shall be maintained systematically.

**(iv) Preservation control—**

(a) A detailed specification shall be laid down by the manufacturer to safeguard the product from adverse effect of weather conditions.

(b) The product shall be well preserved both during storage and during transit.

**(v) Packing control—**

Packing specifications shall be laid down with a view to satisfying the controls mentioned in Annexure IV hereto for packing the aforesaid product and shall be rigidly implemented.

**(2) Inspection.**—The inspection of automobile spares, components and accessories intended for export shall be carried out with a view to seeing that the above mentioned controls have been exercised at the relevant levels satisfactorily and that the automobile spares, components and accessories conform to the standard specifications recognised for the purpose.

**4. Procedure of Inspection.**—(1) The exporter shall give intimation in writing to any one of the Agencies recognised under section 7 of the Act and submit along with such intimation a declaration that the consignment of the automobile spares, components and accessories has been or is being manufactured by exercising quality control measures as per controls referred to under rule 3 and that the consignment conforms to the requirements of the specifications recognised for the purpose.

(2) The exporter shall also furnish to the Agency the identification marks applied on the consignment.

(3) Every intimation and declaration under sub-rule (1) shall reach the office of the Agency not less than 15 days prior to the despatch of the consignment from the manufacturers/exporters premises.

(4) On receipt of the intimation and declaration under sub-rules (1) and (2) the Agency on satisfying itself that during the process of manufacture adequate quality controls provided under rule 3 and instructions issued by the Export

Inspection Council have been exercised and the products conform to the standard specifications recognised for the purpose, shall issue a certificate declaring the consignment as export worthy.

**5. Place of Inspection.**—Inspection under these rules shall be carried out either at the premises of the manufacturer or any other premises where adequate facilities for inspection and testing exist.

**6. Inspection Fee.**—A fee of 20 paise for every hundred rupees of the F.O.B. value of each consignment shall be paid by the exporter to the Agency as inspection fee under these rules.

**7. Appeal.**—(1) Any person aggrieved by the refusal of the Agency to issue a certificate under sub-rule (4) of rule 4 may, within 10 days of the receipt of the communication of such refusal by him, prefer an appeal to a panel of experts as may be appointed for the purpose by the Central Government.

(2) The quorum for the panel of experts shall be three.

(3) The decision of the said panel of experts on any such appeal shall be final.

#### ANNEXURE IV

(See Rule 3)

#### Levels of Control

Sl. No.	Requirements	Reference	No. of samples to be tested	Lots size.
1	Material . . . . .	Standard specification recognised for the purpose.	Adequate No. based on SQC.	Each consignment.
2	Dimensions with tolerances (a) Critical . . . . . (b) Other . . . . .	Do. Do.	Each Adequate No. based on SQC.	Each batch of production. —
3	Workmanship & Finish (visual)	Do.	Each.	—
4	Casting defects	Do.	Each	—
5	Grade/metallurgical requirement of casting	Do.	1 No.	Items manufactured under identical conditions.
6	Hardness for heat treated parts.	Do.	3 Nos.	Each charge from each oven
7	Electroplating (a) Adhesion . . . . .	Do.	1 No.	Each batch's production.
8	(b) Thickness . . . . . (a) Insulation Resistance for electrical parts. (b) High Voltage test	Do. Do.	1 No. Each	Do. —
9	(a) Shore hardness for rubber (b) Ageing test parts.	Do. Do.	3 Nos. 1 No.	Each batch. Do.
10	Adhesion strength for rubber bonded parts.	Do.	3 Nos.	Do.
11	Functional test for complete assemblies wherever required	Do.	1 No.	Adequate number based on SQC.
12	Packing: *(a) Appearance . . . . . **(b) Drop Test . . . . . (c) Rolling Test . . . . . (d) Water Spraying Test . . . . .	Do. Do. Do. Do.	Each 1 No. 1 No. 1 No.	Each consignment. Do. — Each design.

\*The package shall be well finished and have a good appearance.

\*\*The inner contents of the package shall be so packed as to withstand Drop Test, Rolling Test and Water Spraying Test as given below :

(1) Drop Test (to be restricted to head load upto 37 kg.).—The package to be dropped from a height of one metre once on the largest flat surface, once on the longest edge and once on any corner of its own.

- (ii) Rolling Test (to be restricted upto a weight of 500 kg.).—The package to be subjected to rolling on its sides either 6 metres forward and 6 metres backward or 12 metres in one direction only.
- (iii) Water Spraying Test.—The package to be allowed to be exposed against a water spray equivalent to a normal sudden monsoon shower for five minutes.

### ANNEXURE V

#### 1. Specification for Piston Pins

##### 1. Dimensions.

1.1. Dimensions of the piston pins shall be as per the design agreed to between the foreign buyer and the seller subject to the following minimum tolerances.

##### 2. Tolerance.

2.1. The tolerance on outside diameter of the piston pin shall be  $\pm 0.008$  mm.

2.2. The general tolerance for fully floating pins shall be  $\pm 0.10$  mm.

2.3. For pins clamped rigidly at the small end, the general tolerance shall be  $\pm 0.25$  mm.

##### 3. Hardness.

3.1. The hardness of the piston pin shall not be less than 60 Rockwell number on the C. Scale.

##### 4. General.

4.1. The piston pin shall be free from cracks, tool marks and other manufacturing defects. The sharp edges shall be suitably rounded off. The surface finish of the piston pins shall be between 15 to 20 Microns.

#### 2. Specifications for Inlet and Exhaust Valves for Internal Combustion Engines.

##### 1. Material.

1.1. The valves shall be manufactured from a steel having a minimum tensile strength of 80 Kgf/mm<sup>2</sup>.

##### 2. Hardness.

2.1. The valves shall have a hardness of 550 to 650 DPN (or its equivalent) at the tappet face and the seating face.

##### 3. Dimensions

3.1. Dimensions of the valves shall be as per design agreed to between the foreign buyer and the seller subject to the following minimum tolerances given in the Table below:

TABLE  
Tolerances on Dimensions of Valves

Sl. No.	Dimensions	Tolerance
1	Valve Stem diameter . . . . .	$\pm 0.000$ mm $-0.125$ mm
2	Concentricity of valve stem . . . . .	$0.013$ mm
3	Concentricity of head . . . . .	$0.076$ mm
4	Straightness of stem . . . . .	$0.025$ mm
5	Overall length . . . . .	$\pm 0.25$ mm
6	Valve Face angle . . . . .	$\pm 0.5^\circ$
7	Thickness of valve head . . . . .	$\pm 0.25$ mm
8	Diameter of valve head . . . . .	$\pm 0.05$ mm
9	Other dimensions. . . . .	$\pm 0.13$ mm

#### 4. General

- 4.1. The valves shall be manufactured by upsetting process.
- 4.2. The valves shall be finished smooth and shall be free from folding laps due to faulty upsetting process and tool marks. The valves shall be free from any cracks and other manufacturing defects.

#### 3. Specifications for Connecting Rod including its Nuts and Bolts.

##### 1. Material

The connecting rod shall be forged from nickel, chromium and molybdenum alloy steel conforming to EN-17 or its equivalent.

##### 2. Hardness

2.1. The hardness of the finished connecting rod shall be between 220 to 270 Brinell hardness number.

##### 3. Cross Section

3.1. The cross section of the connecting rod shall be of I-type with rounding on the top and the bottom. The rods shall be so forged that its longitudinal axis lies in the plane of rotation.

##### 4. Dimensions

4.1. Dimensions of the connecting rod shall be as per the design agreed to between the buyer and the seller subject to the following tolerances.

##### 5. Tolerances

5.1. Tolerance on width of the top and bottom flanges of the I-Section shall be +0.60 mm. and -0.40 mm.

5.2. Tolerance on the web. of I-Section shall be +0.80 mm. and -0.00 mm.

5.3. Tolerance on height of I-Section shall be  $\pm 0.12$  mm.

5.4. General Tolerance shall be 0.25 mm.

5.5. Critical tolerances other than specified above shall be as per the design of the connecting rod.

##### 6. Weight

6.1. All the connecting rods of same type and design shall be of equal weight within a tolerance of  $\pm 3.5$  mm.

##### 7. Straightness

7.1. The connecting rod forging shall be straight within  $\pm 0.8$  mm. on the overall length.

##### 8. Bush bearings

8.1. The bush bearings may be of bronze, babbitt metal or any other suitable bearing alloy. The bushes shall be well finished and their dimensions shall be as per the design agreed to between the buyer and the seller.

##### 9. Connecting rod nuts, bolts and studs

9.1. The connecting rod nuts, bolts and studs shall be manufactured from steel having minimum tensile strength of 86 kgf/mm<sup>2</sup>. The bolts shall be machined or manufactured in such a way as to have uniform strength throughout their length. Proper locking device shall be provided for the nuts and bolts. The connecting rod bolts/studs shall have a clear fit in the corresponding holes in connecting rod.

##### 10. General

10.1. The connecting rod shall be free from cracks, internal flaws or inclusions and other harmful defects.

#### 4. Specifications for Single Cylinder Fuel Injection Pumps.

##### 1. Dimensions

1.1. Dimensions of the pump shall be as per the design agreed to between the foreign buyer and the seller.

**2. Construction**

2.1. The fuel injection pumps shall be of robust construction incorporating the suitable quality material and workmanship in accordance with the best trade practice.

**3. Test for tightness against fuel inlet pressure**

3.1. The fuel injection pump shall be submerged in the test oil (any light and chemically inert oil) maintained at 50°C and an air pressure of 1 kgf/cm<sup>2</sup> shall be applied at the fuel inlet. There shall be no leakage of air from any part of the pump.

**4. Test for tightness against injection pressure**

4.1. The fuel injection pump when operated with test oil at 50°C against the nozzle release pressure of 175 kgf/cm<sup>2</sup>, it shall not show any leakage between delivery valve and pump body.

**5. Pump Discharge**

5.1. The pump discharge shall be within  $\pm$  10 per cent of the rated discharge.

**5. Specifications for Radiators****1. Material**

1.1. The radiating element shall be made of either copper or brass.

**2. Dimensions**

2.1. The dimensions and shape of the radiator shall be as per the design agreed to between the foreign buyer and the seller.

3. All the joints shall be mechanically sound. The cooling surfaces shall be made of good conductors of heat, and resistant to the cooling medium.

**4. Soldering/Brazing**

4.1. All metal to metal joints shall be soundly soldered/brazed and shall be free of any defects or flaws.

5. There shall not be any undue blocking of passage of water or the coolant while circulating through the radiator.

**6. Air Leakage Test**

6.1. There shall not be any leakage in any part of the radiator when it is tested at an air pressure of 0.70 kgf/cm<sup>2</sup>.

**7. Painting**

7.1. The painting of the radiator (wherever applicable) shall be uniform, hard dry and adherent. The paint shall be heat resistant and capable of withstanding a temperature of 120°C without any damage.

**6. Specifications for Automobile Electric Horns (Vibrating type and Wind Tone type).****1. Dimensions**

1.1. The dimensions of the horns shall be as per the design agreed to between the foreign buyer and the seller.

**2. Interchangeability**

2.1. Components of a particular model and type shall be interchangeable. Mounting arrangements of the horn shall be so designed that one make and type of horn is easily replaceable by another.

**3. High voltage test**

3.1. The test piece shall be isolated from the condenser and the internal ground and shall be subject to one minute electrification with an alternating current of 500 volts RMS at 50 c/s. between any of the terminals and the ground. The test piece shall satisfactorily withstand this test without arcing or puncture.

**4. Function**

4.1. The horn shall function satisfactorily when working at  $\pm$  15 per cent of the rated voltage of the horn.

### 5. Load Test

5.1. The load current of the horn shall not exceed the following values:—

<i>Rated Voltage of the horn</i>	<i>Maximum Current</i>
Upto 24 Volts.	20 Amperes.
Upto 12 Volts.	10 Amperes.
Upto 6 Volts.	5 Amperes.

### 6. Bump test

6.1. The horn assembly shall be strapped to a horizontal support of wood and shall be allowed to fall freely from a height of 5 cm. The horn shall be subjected to 50 such consecutive falls. After this, the horn shall not show any sign of damage and shall pass the load test as specified in clause 5.

### 7. Sound Loudness test

7.1. This test may be carried out under prevailing atmospheric conditions and the level of the background noise shall be such that the reading produced on the meter by the noise is at least 10 dB below that produced by the horn under test

The test may be carried out either in anechoic room or in an open space in which there is no obstacle within a radius of 12 metres and there shall be no acoustical focussing effects or nearly parallel walls. The horn shall be mounted in such a way that the sound waves emitted from the horn shall be directed towards the microphone of the sound level meter in the horizontal plane. The microphone shall be placed in such a position that it is on the axis of the radiating horn and that the sound waves are incident parallel to its diaphragm. For this test, weighting network curve C shall be used on the sound level meter. The distance between the diaphragm plane and the centre of microphone shall be  $200 \pm 1$  cm. The microphone shall be adjusted sideways or up and down so as to obtain the highest possible meter reading. The measured sound pressure level of the horn shall be between 90 and 115 dB when the horn is connected to its rated voltage.

### 8. Painting

8.1. The painted surfaces shall be uniform, hard dry and adherent. A suitable test shall be carried out to check the adhesion of the painted surfaces.

### 9. General

9.1. The horn assembly shall be free from constructional and manufacturing defects.

## 7. Specifications for Ignition Coils

### 1. General

Ignition coils shall be constructed from the most suitable materials free from flaws and suitable for tropical use. Any material used in the construction shall not be readily ignitable. Any material used shall be either inherently stable under exposure to all types of weather conditions or provided with a surface treatment to all faces and edges, applied after all machining and fabricating processes are completed so as to ensure stability of the material on exposure to weather. No hygroscopic material shall be used unless it has been previously rendered moisture-proof.

### 2. Construction

2.1. Ignition coils shall be so designed as to withstand moisture, the heat developed in the windings, and the corona effects.

2.2. Ignition coils shall be filled with an insulating material, such as oil or paraffin-like material. In addition to providing insulation, the oil or other material shall provide rapid heat dissipation and keep corona effects to a minimum.

2.3. To prevent ignition coils from absorbing moisture, they shall be hermetically sealed.

2.4. The outer casing of ignition coils may also be provided with cooling fins.

**3. Dimensions**

3.1. The overall dimensions of the ignition coil shall be as per the design agreed to between the foreign buyer and the seller.

**4. Workmanship and Finish**

4.1. All parts shall be manufactured in a thoroughly workman like manner in accordance with the current engineering practice. All steel surfaces to be painted shall be suitably pretreated before painting.

**5. Interchangeability**

5.1. Components of a particular model and type shall be interchangeable.

5.2. Mounting arrangements of the ignition coils shall be so designed that one make and type should be easily replaceable by another.

**6. Insulation Resistance (Dry) Test**

6.1 This test may be carried out at the prevailing atmospheric temperature and humidity.

6.2. The insulation resistance shall be measured between the coil primary terminal and outer casing by the application of a DC voltage of 500 V for one minute.

6.3. The insulation resistance value, thus measured, shall be not less than 10 megohms.

**7. Performance Tests**

7.1. Secondary Voltage.—The coil shall be first fitted with a prescribed distributor or contact breaker and tested for operation at high temperature and low voltage as specified in 7.2 and 7.3 respectively. Under these conditions there shall be no misfiring for the test for operation at high temperature whereas the permitted percentage of misfiring shall be not more than 25 in the case of test for operation at low voltage. Spark gap shall be kept at 6 mm.

7.2. Test for Operation at High Temperature.—After keeping the coil in air at 90°C for not less than 60 minutes the test for operation at high temperature shall be done under the following conditions:—

## (a) Power Supply

For 6-V type . . . . .	6 V
For 12-V type . . . . .	12 V
For 24-V type . . . . .	24 V

## (b) Load resistance

(1) Between coil and distributor . . . . .	10000 ohm
(2) Between distributor and spark gap with three electrodes . . . . .	10000 ohm
(3) With contact breaker alone . . . . .	20000 ohm.

## (c) Rotation speed of distributor or contact breaker. . . . . 500 rev/min.

7.3. Test for Operation at Low Voltage.—This test shall be done under following conditions in the prevailing atmospheric temperature and humidity:—

## (a) Power Supply

For 6-V type . . . . .	4 V
For 12-V type . . . . .	8 V
For 24-V type . . . . .	16 V

## (b) Load resistance

(1) Between coil and distributor . . . . .	10000 ohm
(2) Between distributor and spark gap with three electrodes . . . . .	10000 ohm
(3) With contact breaker alone . . . . .	20000 ohm

## (c) Rotation speed of distributor or contact breaker. . . . . 150 rev/min

**8. High Voltage Test**

8.1. After keeping the coil at 90°C in air for not less than 60 minutes the high voltage test shall be conducted. The coil shall be able to withstand the high voltage test for more than one minute under the conditions specified below. When an

insulator is put in the gap, there shall be no failure of the dielectrical material or flashover from high tension connection.

**(a) Power supply**

For 6-V type . . . . .	8 V
For 12-V type . . . . .	15 V
For 24-V type . . . . .	30 V

**(b) Load resistance**

(1) Between coil and distributor. . . . .	10000 ohm
(2) Between distributor and spark gap with three electrodes . . . . .	10000 ohm
(3) With contact breaker alone. . . . .	20000 ohm

**(c) Rotation speed of distributor or contact breaker . . . . .** 2000 rev/min.

**9. Load Test**

9.1. The primary coil shall be connected to the rated voltage for not less than 3 hours. At the end of this test, the coil shall be examined for any evidence of damage in winding or other parts and shall be subjected to performance test as follows:

**(a) Power supply**

For 6-V type . . . . .	6 V
For 12-V type . . . . .	12 V
For 24-V type . . . . .	24 V

**(b) Load resistance**

(1) Between coil and distributor. . . . .	10000 ohm
(2) Between distributor and spark gap with three electrodes . . . . .	10000 ohm
(3) With contact breaker alone. . . . .	20000 ohm

**(c) Rotation speed of distribution or contact breaker. . . . .** 500 rev/min.

When tested under these conditions there shall be no misfiring.

**8. Specifications for starter motor and its armature (up to 24 volts D.C. only)**

**1. Visual Examination**

1.1. Starters shall be examined for finish and adequate lubrication in revolving parts. All the parts shall be finished properly and shall be free from harmful defects, faults or cracks.

**2. Dimensions**

2.1. The dimensions, type and rating of the starter shall be as per agreement between the foreign buyer and the seller.

**3. Flash Test**

3.1. A flash test shall be carried out between the terminals and external metal part of the starter by application of an A.C. voltage of 500 volts rms. having frequency of 50 c/s. If necessary, as for example, if any of the terminals is internally grounded, the earth connection may be disconnected. As a result of this test, there shall be no looseness, cracking, charring, arcing or puncture of any of the parts.

**4. Insulation resistance test**

4.1. The insulation resistance shall be measured between the terminals and the external metal parts of the starter by the application of a D.C. voltage of 500 volts for one minute under the prevailing atmospheric temperature and humidity conditions. If necessary, for example, if any of the terminals is internally grounded, the earth connection may be disconnected. The insulation resistance values thus measured shall be not less than one megohm.

**5. Free Running Test**

5.1. Run the starter upto full speed with no load on nominal voltage supply. There shall not be any undue sparking of brushes on commutator and there shall not be any excessive noise due to armature rubbing on poles or due to high commutator bars. There shall not be any undue vibration during this test.

### 6. Vibration Test

6.1. The starter motor shall be rigidly fixed on a suitable vibrating machine and subjected to a simple harmonic vibration with an amplitude of 1.5 mm and, a frequency between 30 to 50 c/s. for a period of one hour in the direction of each of the three major axis of the test piece. The stater motor shall be deemed in have passed this test if there is no evidence of any damage to the motor and it passes the free running test as given in clause 5.

### 9. Specification for Sparking Plugs

#### 1. Dimensions

1.1. Dimensions of the sparking plugs shall be as per the design agreed to between the buyer and the seller.

#### 2. Tolerances

2.1. The tolerances on the terminal threads, hexagonal body and plug threads shall be such as to provide inter-changeable parts.

#### 3. Acceptance Tests

3.1. The following acceptance tests shall be carried out.

3.1.1. *Sparking under pressure*.—The sparking under a pressure of 9 kgf/cm<sup>2</sup> at room temperature shall be regular and of equal intensity.

3.1.2. *Insulation Resistance*.—Insulation Resistance at a temperature of 500°C shall not less than 1 megaohm.

3.1.3. *Gas leakage*.—Gas leakage at 200°C and 15 kg/cm<sup>2</sup> pressure shall be not more than 50 ml. per minute and gas leakage at a pressure of 15 kgf/cm<sup>2</sup> and room temperature shall be not more than 5 ml. per minute.

3.1.4. *Thermal Shock Test*.—When subjected to the 'Thermal Shock Test', there shall be no crack on the insulators. The thermal shock test shall be carried out on the insulator alone by dipping it into a molten tin bath maintained at 500°C upto half the length of the insulator foot and kept in that position for 4 minutes and after that taking it out and allowing it to cool to room temperature. After this, the insulator shall be dipped in colouring medium like alcohol fuschine solution having 0.5 per cent fuschine dissolved in methyl alcohol. After this test, the insulator shall be free from cracks.

3.1.5. *Torque Test*.—There shall be no breakage at the throat of the spark plug when it is subjected to a torque of 5 kgf/cm by a torque wrench, screwing the spark plug in a hardened steel block.

3.1.6. *Impact Test*.—The plugs shall be able to sustain an impact of 1.5 kgf. cm.

#### 4. General

4.1. The sparking plugs shall be free from manufacturing and constructional defects.

#### 7. Characteristic Curves of the Starter Motor

7.1. The characteristic curves for the following shall be determined and supplied by the manufacturer under specified conditions.

(a) Torque vs. current.

(b) Speed vs. current.

(c) Voltage at the terminals vs. current.

The starter motor shall conform to the characteristics mentioned above.

### 10. Specification for Automobile Dynamos, its Armatures and Field Coils.

#### 1. Materials

##### 1.1. Laminations—

1.1.1. Laminations for core assembly shall be of uniform dimensions and electrically insulated from one another at least from one side by a thin coating of insulating film or material (oxide film is included for the purpose).

1.1.2. The laminations shall be flat and free from burrs or sharp edges.

**1.2. Shaft**

1.2.1. The shaft shall be made of steel having a minimum tensile strength of 50 kgf/mm<sup>2</sup>.

**1.3. Commutator**

1.3.1. The commutator segments shall be made of copper having conductivity of not less than 97 per cent. Insulation separators shall be made of mica, built up mica, or resin bounded asbestos or similar material. The commutator shall be turned and when tested in a dial gauge between Vee blocks shall not give a bar to bar variation exceeding 0.005 mm. eccentricity on total dial reading.

**1.4. Winding**

1.4.1. The windings shall be suitably insulated from the lamination slots and the end laminations shall be of fibre or similar insulating material. The winding wire shall be synthetic enamelled wire conforming to relevant Indian standards.

**1.5. Solder**

1.5.1. Wherever solder is employed, it shall be not inferior to 40/60 tin lead solder and shall be free from soldering defects.

**1.6. Insulation**

1.6.1. The insulating cover shall be made of mica, built up mica or laminated bounded paper or cloth material with proper insulation properties. Segments shall be parallel to the axis of the armature.

**1.7. Field Coils**

1.7.1. The total resistance of the field coil shall be within  $\pm$  3 per cent. of the rated resistance. The shape of the field coils shall be uniform.

**2. Output**

2.1. The output of the dynamo in watts shall be within —5 per cent. of the rated output at rated voltage.

**3. Flash Test For Armature**

3.1. The armature shall be subjected to a flash test between commutator and shaft with an alternating current at 500 v. and 50 c/s. As a result of this, there shall be no looseness, cracking, charring, arcing or puncture of any portion of the armature.

**4. Flash Test For Field Coils**

4.1. The field coil after being fitted into the yoke shall be flash tested between coil terminal and yoke with an alternating current of 500 v. having a frequency of 50 c/s. As a result of this test, there shall be no looseness, cracking, charring, arcing or puncture of any portion of the field coil.

**5. Temperature Rise Test**

5.1. After running the dynamo for one hour, the temperature rise above the ambient temperature shall not be more than 70° C, using either resistance method or by thermometer.

**6. Overspeed Test**

6.1. When the generator is run at a speed 10 per cent. higher than the rated speed for one hour, the generator shall not show any signs of failure and shall conform to the requirements of Clause 2 after this test.

**7. Test for Coils**

7.1. When the rated voltage is applied to the coils of the armature, the ammeter shall record equal readings for all coils within  $\pm$  2 per cent.

**8. Noise and Vibration**

8.1. During running of the dynamo, there shall be no undue vibration and noise and the running shall be smooth.

**9. Dimensions**

9.1. Overall dimensions of the generator and armature shall be as per the design agreed to between the buyer and the seller.

**10. Life**

10.1. The life of the generator in terms of hours of running at rated output shall be declared by the seller.

**11. General**

11.1. The generator and its parts shall be free from constructional defects.

*11. Specifications for Headlights Assembly and Sealed Beamlights***1. Material**

1.1. **Lens.**—The lens shall be free from cracks, flaws and distortion. The lens shall be free from wrinkles and other defects which have an adverse effect on the lighting characteristics and appearance of the lens.

1.2. **Body.**—The body of the head-light shall be protected either by stove enamelling or by electroplating.

1.3. **Reflector.**—They shall be bright finished by silver plating, nickel plating or coated with aluminium by 'Aluminium Vacuum Deposition' process. The plated surface shall be uniform and free from plating defects.

1.4. **Gasket.**—Gasket used to seal movable parts shall be so designed or attached that they should not hinder or interfere with the case of re-assembling in service when replacing burnt out bulb. The material shall be water-proof and shall be free from cracks and other defects.

1.5. **Retaining and Mounting Ring.**—Positive means shall be provided for holding the unit to the mounting ring. The fastening means shall be deemed adequate if it is able to withstand and hold the light unit securely in its proper position at the end of 25 replacements.

1.5.1. When the light unit is secured between the retaining ring and the mounting ring, it shall be held tight so that it will not rattle.

1.6. **Connector.**—The voltage drop between the light unit contact and connector end of a 75 mm. wire lead from the socket shall not exceed 40 milli volts with 10 ampere load.

1.7. **Lamps.**—The lamps used shall conform to the "Specifications for Automobile Lamps" recognised for the purpose.

1.8. **Assembly.**—The assembly shall be satisfactory and dust-proof.

**2. Dimensions**

2.1. The dimensions of the various parts of the lights shall be as per the design agreed to between the foreign buyer and the seller. The tolerances on the various dimensions shall be such as to provide inter-changeable parts.

**3. Bulb holder and Contact points**

3.1. The bulb holder and the contact points for the bulb shall be free from rust, scale or any other harmful defects. The electrical conducting parts of the bulb holder shall be made from suitable material capable of withstanding the rated current and voltage as applicable to the bulb fitted in the holder, without getting over heated.

**4. Painting**

4.1. The painted surfaces shall be uniform, hard, dry and adherent. A suitable test shall be carried out to check the adhesion of the points.

**5. General**

5.1. The various parts of the light shall be free from dents, deep drawing marks, scratches, cracks, burns and other manufacturing defects.

**6. Tests**

6.1. **Electrical continuity.**—Each and every light shall be checked for its electrical continuity by fitting a suitable bulb and applying the rated voltage between the terminals of the holder. The bulb shall glow properly under above conditions.

6.2. **Plating test.**—All plated surfaces shall be subjected to the following test:

6.2.1. **Test.**—The plated surface shall be rubbed rapidly and firmly for 15 seconds with a smooth metal implement. A suitable burnishing implement is a copper disc (e.g. a copper coin) used edgewise and broad-side. The pressure shall be sufficient to burnish the film of plating at every stroke, but not so great as to cut the deposit. The burnished area shall then be examined. The adhesion of the plating shall be

deemed adequate if there is no indication of the deposit becoming detached from the base metal.

**6.3. Vibration test.**—The test piece mounted on a suitable support shall be rigidly fixed on a suitable vibrating machine and subjected to a simple harmonic vibration with an amplitude of 1.5 mm. and at a frequency between 30 to 50 c/s. for a period of one hour in the direction of each of the three major axis of the light. At the end of this test, the test piece shall be examined and any unit showing evidence of material defects, lens or reflector rotation, displacement or rupture of parts except filament lamp failure, shall be considered to have failed in the test.

**6.4. Test for operation.**—All the lights shall be tested by fitting the bulb and applying the rated voltage to ensure satisfactory operation of the assembly.

**6.5. Test for gaskets**—The gaskets shall be tested as follows:—

A complete light unit shall be placed, lens down, in an oven at the temperature held at  $115^{\circ} \pm 2^{\circ}$  C. for a period of one hour. After this test there shall be no evidence of discolouration or deposit on the reflecting surface.

**6.6. Corrosion resistance test.**—The automobile lights shall be subjected to the spray of a 5 per cent sodium chloride solution in water for a period of 24 hours at room temperature. After removal from the salt spray chamber, the parts shall not show any sign of corrosion or electrolytic action which will adversely affect the functioning of any part of the device.

## 12. Specifications for Automobile Lamps (Bulbs)

### 1. Dimensions

1.1. The dimensions shall be as per the design agreed to between the foreign buyer and the seller.

### 2. Luminosity

2.1. The luminosity of the bulbs at the rated voltage shall be within 10 per cent of the rated one.

### 3. Efficiency

3.1. The efficiency of the lamps in terms of lumens per watt shall be not less than 4.5.

### 4. Test for Cap

4.1. The caps shall be properly attached to the bulbs. The bulb shall be fixed to the holder 50 times, and after this test the cap shall not become loose and there shall not be any damage to any part of the lamp.

### 5. Solder

5.1. The solder shall be so applied as not to interfere with proper engagement of the cap in the holder and to ensure satisfactory electrical contact.

### 6. Life

6.1. The life of the bulb shall be not less than 1000 hours at rated voltage.

### 7. Electrical Continuity

7.1. Each and every bulb shall be checked for its electrical continuity.

### 8. General

8.1. The bulbs shall be clear, uncoloured and free from detrimental effects. The filament of the bulbs shall be uniform in shape and size.

## 13. Specifications for Propellor Shafts

### 1. Material

1.1. The propellor shafts shall be manufactured from steel conforming to SAE 2340, 2345 or 4140 or their equivalent.

### 2. Hardness

2.1. The hardness of the splined part of the shafts shall be between 50 to 55 Rockwell Number on C scale.

### 3. Dimensions

3.1. The dimensions shall be as per the design agreed to between the foreign buyer and the seller subject to the following minimum tolerances.

#### 4. Tolerances

4.1. Tolerance on the dimensions of the splined parts shall be between —0.02 mm. & —0.03 mm.

4.2. The general tolerance shall be  $\pm 0.25$  mm.

#### 5. General

The propeller shafts shall be free from cracks, internal flaws or inclusion and other harmful defects. The shafts shall be smeared with antirust oil or grease.

### 14. Specification for Axle Shafts

#### 1. Material

1.1. The axle shafts shall be manufactured from Nickel Chromium alloy steel having the following composition:

1. Carbon . . . . .	0.35 to 0.45 percent.
2. Manganese. . . . .	0.45 to 0.70 percent.
3. Chromium . . . . .	0.90 to 1.40 percent.
4. Sulphur . . . . .	0.05 percent maximum
5. Silicon . . . . .	0.1 to 0.35 percent.
6. Nickel . . . . .	1.3 to 1.80 percent.
7. Molybdenum . . . . .	0.2 to 0.35 percent.
8. Phosphorus. . . . .	0.05 percent maximum.

#### 2. Hardness

2.1. The hardness at the splined ends of the axle shaft shall be within 40 to 55 Rockwell number on 'C' scale.

#### 3. Dimensions

3.1. Dimensions of the axle shafts shall be as per the design agreed to between the foreign buyer and the seller, subject to following minimum tolerances.

#### 4. Tolerances

4.1 Tolerance on splined diameter . . . . . =  $\pm 0.12$  mm

4.2 Tolerance on splined length . . . . . =  $\pm 0.12$  mm

4.3 Tolerance on over all length . . . . . =  $\pm 1.25$  mm

4.4 Tolerance on other dimension. . . . . =  $\pm 0.25$  mm

#### 5. General

5.1. The axle shafts shall be free from cracks, splits, pits and other harmful defects.

### 15. Specifications for Automotive Brake Lining

#### 1. Material

1.1. The material of the lining shall be asbestos fibre mixed with suitable fillers and bonding agents and shall satisfy the requirements given in the subsequent clauses.

#### 2. Dimensions

2.1. The dimensions shall be as per the design agreed to between the foreign buyer and the seller subject to the following minimum tolerances.

#### 3. Tolerances

3.1. Upto and including 5 mm thickness, the tolerance on thickness shall be + 0.00 mm and — 0.2 mm and tolerance on width shall be  $\pm 0$  mm — 0.8 mm. For over 5 mm thickness, the tolerance on thickness shall be + 0 mm and — 0.3 mm and tolerance on width shall be + 0 mm and — 0.8 mm.

#### 4. Depth of Counterbore for rivets

4.1. Unless required otherwise by the foreign buyer, for the brake lining of less than 5 mm thickness, the countersinking should be 50 per cent of the thickness of the lining. For lining above 5 mm thickness, the counter-sinking should be 2/3rd of the thickness of lining.

### 5. Oven Test

5.1. The lining shall not show any evidence of blistering, swelling or distortion when heated in an oven for 2 hours at 200°C. The change in thickness shall not be more than 0.25 mm.

### 6. Wear Properties

6.1. The manufacturer shall declare the wear properties of the particular quality of lining in terms of loss in volume per unit of work done (e.g. cm<sup>3</sup>/kwh or in<sup>3</sup>/hp h).

### 7. Friction Requirements

7.1. The co-efficient of friction for the brake lining shall be not less than 0.22.

### 8. General

7.1. The co-efficient of friction for the brake lining shall be not less than scorings, indentations, unevenness or other defects affecting its life and serviceability. The frictional characteristics of the lining shall be uniform throughout the life of the wearing portion. The lining shall have sufficient mechanical strength to permit it to be drilled and riveted securely to brake shoes, so that it does not crack during the rivetting operation or slip or crack during use.

## 16. Specifications for Wheel Rim and Disc Assembly

### 1. Material

1.1. The rim and Disc may be made of mild steel or any other suitable quality of steel conforming to SAE 1010.

### 2. Dimensions

2.1. Dimensions of the rim and disc shall be as per the design agreed to between the foreign buyer and the seller subject to the minimum tolerances given below:

### 3. Tolerances

3.1. The general tolerance on the various dimensions shall be  $\pm$  0.25 mm. For critical dimensions, the tolerance shall be as per the design. The tolerance on angles shall be  $\pm 1^\circ$ .

### 4. Concentricity

4.1. Wheels must be within 113 mm total indicator reading on radial and lateral run out when checked from centre hole and mounting face.

### 5. Riveting

5.1. Rivetting shall be sound and the heads shall be properly countersunk. Rivets shall not project more than 0.80 mm above rim base and shall be free from burrs and sharp edges.

### 6. Balance

6.1. The wheel assembly shall not be more than 8.5 gm. metre out of static balance.

### 7. General

7.1. The rim and disc shall be free from sharp edges sharp bends (the least radius of the bend 3 mm), cracks, burrs and other surface defects.

### 8. Painting

8.1. The painted surfaces shall be uniform, adherent and hard dry 'Scratch test' shall be carried out to ensure the proper adhesion of the paint.

## 17. Specifications for Brake Drums

### 1. Material

1.1. The material used for the brake drums shall be cast iron with a minimum tensile strength of 20 kgf/mm<sup>2</sup>.

### 2. Dimensions

2.1. Dimensions and other details shall be as per the design agreed to between the buyer and the seller subject to the following minimum tolerances.

**3. Tolerance**

- 3.1 Tolerance on the inside diameter of the brake drum shall be  $\pm$  0.12 mm.  
 3.2 General tolerance shall be 0.25 mm.

**4. General**

- 4.1 The castings shall be free from blow holes, porosity, cracks, cold shuts and other harmful defects.

**18. Specifications for King Pins****1. Material**

- 1.1 The material of the king pin shall be nickel chromium alloy steel with a minimum tensile strength of 86 kgf/mm<sup>2</sup>.

**2. Hardness**

- 2.1. The hardness of the king pins shall be between 55 and 62 Rockwell number on 'C' scale.

2.2. The case depth of hardness shall not be less than 1.25 mm.

**3. Design and dimensions**

- 3.1 The dimensions of the king pins shall be as per the design agreed to between the foreign buyer and the seller subject to the following minimum tolerances.

**4. Tolerances**

- 4.1 The tolerance on length shall be  $\pm$  0.5 mm.  
 4.2 The tolerance on diameter shall be  $\pm$  0.5 mm.  
 4.3 The general tolerance shall be  $\pm$  0.25 mm.

**5. Workmanship and finish**

- 5.1. The surface of the king pin shall be finished smoothly as per the best engineering trade practice and shall be free from burrs, scratches, cuts or tool marks. The king pins shall be free from cracks, flaws and other manufacturing defects.

**6. Preservation**

- 6.1. The king pin shall be fully covered with rust preventive oil or grease suitable for the purpose.

**19. Leaf springs and its leaves****1. Material**

- 1.1. Spring leaves: shall be manufactured from EN 45 A steel.

- 1.2. Bushes: shall be made from bimetal Gun Metal or brass. If required by the foreign buyer, the leaf spring may be supplied without the bushes.

**2. Hardness**

- 2.1. The leaves shall have a hardness within 34 to 41 Rockwell Number on C scale.

**3. Dimensions**

- 3.1. Dimensions shall be as per the design agreed to between the foreign buyer and the seller subject to the following minimum tolerances.

**4. Tolerances:**

(a) On overall length . . . . .	$\pm$ 3 mm
(b) On individual leaves . . . . .	$\pm$ 3 mm
(c) On width of leaves :	
(i) for 0 to 6.25 cm . . . . .	$+0.50$ mm $-0.25$ mm
(ii) for 6.26 cm to 10 cm . . . . .	$+0.90$ mm $-0.25$ mm
(iii) for 10.10 cm to 12.50 cm. . . . .	$+1.60$ mm $-0.25$ mm
(iv) for 12.60 cm and above. . . . .	$+2.3$ mm $-0.25$ mm

(d) On thickness of leaves.							$\pm 0.18$ mm
(i) Up to 1 cm thickness . . . . .							$\pm 0.30$ mm
(ii) from 1.1 cm upto 2.50 cm . . . . .							$\pm 0.50$ mm
(iii) from 2.51 cm and above . . . . .							$\pm 0.12$ mm
(e) On inside dia of bushes. . . . .							0.00 mm
(f) On unbushed eyes. . . . .							$-0.03$ mm
(g) On camber of leaves. . . . .							$\pm 1/4$ from specified camber.
(h) On camber of the assembled leaves. . . . .							$\pm 1/4$ from the specific camber.

## 5. General

5.1. The flats shall be substantially straight and free from lateral kinks waves, twists or other surface imperfections such as splits, flakes and pits which render them unsatisfactory for spring manufacturing purposes.

## 20. Specifications for Shackle Pins

### 1. Material

1.1. The steel used for the manufacture of shackle pins shall have a tensile strength not less than 86 kgf/mm<sup>2</sup>.

### 2. Hardness

2.1. The hardness of the shackle pins shall be between 55 and 60 Rockwell Number on 'C' Scale.

2.2. The case depth of hardness shall not be less than 1.25 mm.

### 3. Design and Dimensions

3.1. The dimension of the shackle pins shall be as per the design agreed to between the foreign buyer and the seller subject to the following minimum tolerances.

### 4. Tolerances

- 4.1. The tolerance on length shall be . . . . .  $\pm 0.50$  mm
- 4.2. The tolerance on diameter shall be . . . . .  $\pm 0.05$  mm
- 4.3. The general tolerance shall be . . . . .  $\pm 0.25$  mm.

### 5. Workmanship and Finish

5.1. The surface finish of the shackle pins shall be between 20 and 30 microns. The pins shall be free from cracks, tool marks and other manufacturing defects. The sharp edges shall be suitably rounded off.

## 21. Specifications for Helical Spring for Automobile Suspension

### 1. Material

1.1. The springs shall be manufactured from spring steel having the following tensile strength.

Size	Tensile strength in kgf/mm <sup>2</sup> .
(a) Bars of 6 mm. dia. . . . .	110 to 155
(b) Bars over 6 mm dia. . . . .	95 to 150

### 2. Dimensions

2.1. Dimensions of the springs shall be as per the design agreed to between the foreign buyer and the seller, subject to the following minimum tolerances.

### 3. Tolerances

3.1. Tolerances on the dimensions of the springs shall be as follows:—

Tolerance.	
------------	--

3.1.1. Inside coil dia. of the springs.

- (i) 75 mm. or less. . . . .  $\pm 1$  mm.
- (ii) above 75 mm. . . . .  $\pm 2$  mm.

3.1.2. Diameter of the spring wire or bar

- (i) Below 10 mm. dia or width . . . . .  $\pm 0.1$  mm.
- (ii) Above 10 mm. dia or width . . . . .  $\pm 0.2$  mm.

#### 4. Free Height

4.1. After compressing the spring to solid height and slowly decompressing, the free height of the spring shall not exceed the specified value by more than 3 mm. or 1.5 percent whichever is less, nor shall it be less than the specified value by more than 2 mm. or 1 percent whichever is less.

#### 5. Uniformity of pitch

5.1. The pitch of the coils shall be sufficiently uniform so that when the is compressed, unsupported laterally, to a height representing a deflection of 85 percent of nominal total deflection, none of the coils shall be in contact with one another excepting the initial coil in the case of closed end springs.

#### 6. Spring constant

6.1. The load required for 1 inch compression of the spring shall be within + 8 per cent of the rated spring constant value.

#### 7. General

7.1. The bars for the manufacture of the spring as well as the finished spring shall be free from surface cracks, rust seam, decarburisation, piping and other defects.

#### 8 Plating

8.1. In case the springs are plated, the plating shall be uniform and shall withstand the following test for the adhesion of the plating.

##### 8.2. Test

An area of not more than 6.5 sq. cm. of the plated surface shall be rubbed rapidly and firmly for 15 seconds with a smooth metal implement. A suitable burnishing implement is a copper disc (e.g. a copper coin) used edgewise and broadside. The pressure shall be sufficient to burnish the film of plating at every stroke, but not so great as to cut the deposit. The burnished area shall then be visually examined. The adhesion of the plating shall be deemed adequate if there is no indication of the deposit becoming detached from the base metal.

#### 9. Scrag Test

9.1. The spring shall be pressed to solid weight 3 times in quick succession. It shall then conform to the dimensional requirements specified in clause 2, 3 & 4.

### 22. Specifications for Ammeters and Voltmeters

#### 1. Construction

1.1. The construction of the instrument shall be mechanically sound, free from evident mechanical defects, suitable for its purpose, and such as to give reasonable assurance of permanence in mechanical, electrical and magnetic adjustments.

1.2. The instrument shall be contained in a suitable dust-tight case of sufficient strength to afford adequate protection against injury when reasonably used and any accessory apparatus shall, if any, be suitably protected to ensure safety and permanence of the accuracy of indication.

1.3. A case purporting to be water-tight shall withstand complete immersion for one hour, under a 920 mm. (or 3 ft.) head of water, without penetration of moisture into the interior.

1.4. A case purporting to be weather proof shall be so constructed or protected that exposure to weather or splashing of water shall not impair the operation of the instrument.

1.5. The case shall be so constructed that usual variation in temperature and humidity under service conditions shall not affect the indications of the instrument beyond the limits permitted by this standard.

1.6. The case shall be insect-proof.

1.7. All reasonable precautions shall be taken in the design and manufacture of instruments to prevent undue fogging of the instrument glass. No material whose properties are deleteriously affected by exposure to temperature and humidity, shall be used in receiving the glass or such other transparent material dust-proof, weather-proof or water-tight.

## 2. Scale Plate and Marking.

2.1. **Scale Plate.**—The scale plate shall be of metal of white matt enamel finish, on which all markings and figurings shall be in black, unless specifically stated otherwise by the purchaser.

2.2. **Value of Divisions.**—The value of each scale division shall be either 1, 2, or 5 of the units measured or any decimal multiple or sub-multiple of these numbers.

### 2.3. Width of Division.

2.3.1. For all instruments provided with anti-parallax mirror, the width of a scale division within the effective range shall be not less than 0.8 mm. (or 0.03 in.) measured along with bottom line of the scale.

## 2.4. Construction of Scales.

2.4.1. Scale shall consist of long and/or medium and short scale marks.

2.4.2. The scale divisions shall be consistent with the requirements of 2.3. The medium scale mark shall be not less than 1.3 times nor more than 1.5 times the length of the short scale mark. The long scale mark shall be not less than 1.7 times nor more than 2 times the length of the short scale mark.

2.4.3. Short scale marks shall, unless otherwise required by the purchaser, be bounded by two lines running parallel to each other in the direction of the scale throughout its length.

2.4.4. The thickness of the scale mark shall not differ noticeably from the thickness of the pointer knife-edge.

## 2.5. Figuring.

2.5.1. Scales shall in general be figured at suitable long or medium scale marks, but not at both, except that the scale-end marks may be figured irrespective of their lengths.

2.5.2. The digits shall be of such shape as to minimize risk of different digits being confused with one another, and shall be so spaced as to render individual groups clearly distinguishable from adjacent groups.

## 3. Pointer.

3.1. The pointer shall be light and rigid and so shaped as to lend itself to ease and accuracy of reading.

3.2. The pointer shall be insulated from the electric circuit of the instrument unless the scale plate and stops are at substantially the same potential as the pointer and are insulated from the case.

3.3. In any instrument not provided with means for avoiding errors of reading due to parallax, the clearance between the scale and the portion of the pointer which traverses it shall be not more than 1.5 mm. (or 0.008 in.) or 1/100th part of the length of the scale whichever is greater.

3.4. For instruments with platform scales, the length of a pointer other than knife-edge pointer shall be such that the tip extends over more than one third but not over more than two-thirds of the length of the shortest scale-mark.

3.5. A knife-edge pointer shall extend over the whole length of the short scale-marks, but not appreciably beyond them.

## 4. Direction of Deflection.

4.1. Unless otherwise required by the user, the direction of the deflection of the pointer of an instrument, other than a vertical edge-wise instrument, shall be from left to right with an increasing positive quantity and when the angular deflection is more than  $180^\circ$  the direction of deflection of the pointer shall be clockwise with the zero and maximum points below the horizontal centre line.

4.2. Unless otherwise required by the purchaser, the direction of deflection of the pointer of a vertical edge-wise instrument shall be upwards with an increasing positive quantity.

## 5. Zero Adjustment.

5.1. Spring controlled instruments other than flame proof or water-tight instrument shall be provided with a suitable devise accessible from the outside of the case from the front, for adjusting the pointer to zero or any other setting mark without risk of damage to the working parts of the instrument.

### **6. Terminals.**

6.1. When the direction of the current is important, the polarity of the terminals shall be indelibly marked so as to indicate clearly the proper direction of the current through the instrument.

6.2. On the instruments intended for use on direct current, the left-hand or lower terminal, as seen from the front of the instrument, shall, unless otherwise required by the purchaser, be the positive terminal and shall be marked accordingly.

6.3. If on the ground of safety, or for any other reason, it is desirable to earth one terminal that terminal shall be marked 'E'.

### **7. Insulation Resistance Test.**

7.1. The insulation resistance between the terminals and the containing case, or other metal parts not intended to be insulated from the case when the instrument is in use, shall be not less than 10 megohms.

### **8. High-Voltage Test.**

8.1. The instrument shall withstand the high-voltage test when a voltage of five times the rated voltage is applied.

8.2. *Method of Testing.*—The voltage shall be increased from a relatively low value to full test value as rapidly as is consistent with its magnitude being indicated by the measuring instrument. The full test value shall be maintained for one minute and then rapidly reduced to a relatively low value before being switched off.

### **9. Accuracy Test.**

9.1. The error in indication of an ammeter and voltmeter when tested as per standard trade practice shall not exceed 1.5 per cent of the scale range.

10. *Damping Test.*—With the current adjusted to three-fourths of the full-scale value in the case of permanent magnet moving coil instrument and 10 per cent of the full scale value in all other cases, the deflection of the pointer shall not exceed full scale value when the current is suddenly applied.

11. *Vibration Test.*—The instrument shall be mounted on a rigid plate in the normal position and then bolted to the vibration table. The table shall execute a sinusoidal motion of amplitude of  $0.09 \pm 0.04$  mm; the number of vibrations per second being varied from 10 through 100 and back to 10 again in a period of 4 minutes. During this test, there shall be no resonant vibration of any parts of the instrument, of such amplitude as to result in damage to the instrument. On the completion of one cycle of vibration test, the instrument should be deemed to have passed this test if it passes the accuracy test as per clause 9.

*Overload Test.*—An overload test shall be carried out on the instrument if required by the purchaser, who shall also specify the degree of overload.

## **23. Specifications for Automotive Hydraulic Shock Absorbers**

### **1. Material**

1.1. The material used for the fabrication of various parts shall be such as shall satisfy the requirements of the subsequent clauses.

### **2. Dimensions**

2.1. The dimensions including the opening and closing dimensions of the shock absorber shall be as per the design agreed to between the foreign buyer and the seller.

### **3. Visual Inspection**

3.1. The finished product shall be free from dents, flaws, unpainted surfaces and other defects prejudicial to the assembly and operation of the shock absorbers.

### **4. Operation Test**

4.1. The shock absorber shall be tested with the help of a suitable apparatus capable of recording the dampening ability diagram for complete work cycle (compression and rebound) of the shock absorber. The dampening ability diagram shall be in accordance with the design diagram or the design figures specified by the foreign buyer. The operation of the shock absorber shall be smooth and steady.

### 5. Painting

5.1. The paint shall be uniform, hard dry and of proper adherence. The adherence of the paint shall be checked by the following test.

5.1.1. *Test.*—The painted surface shall satisfy the requirements of 'Scratch Test' as laid down in the relevant Indian Standard Specification.

5.2. *Fuel Resistance.*—Immerse a portion of the painted surface of the shock absorber into gasoline at room temperature for 30 minutes. After this test the painted layer shall not dissolve, wrinkle or develop blisters.

6. *Oil.*—The oil used in the shock absorbers shall have the properties given in the table below:

TABLE

Sl. No.	Characteristic	For light duty	For medium duty	For heavy duty.
1.	Viscosity . . .	Saybolt viscosity at 100° F = 65 to 67 seconds, at 210° F = 35.6 seconds average	Saybolt viscosity at 100° F = 118.2 seconds average, at 210° F = 94 to 99	Saybolt viscosity at 100° F = 294.3 seconds, at 210° F = 150—155 seconds.
2.	Flash point. . .	335° F	470° F	425° F
3.	Pourpoint. . .	20° F Max.	25° F	25° F. Max.

### 7. General

7.1. There shall not be any leakage of oil during the operating conditions of the shock absorber.

#### 24. Specifications for Wiper Assembly including its arm and blade

##### 1. Material

1.1. The wiper arm and support for the rubber blade shall be made from suitable quality of spring steel which shall ensure satisfactory performance during usage.

2. The rubber element of the wiper shall be capable of operating between 55°C and —29°C without any damage to it.

##### 3. Dimension

3.1. The dimensions and shape of the wipers shall be as per the design agreed to between the foreign buyer and the seller. The design of the wiper shall be such as is capable of attaining 45 cycles per minute without any damage to its parts.

##### 4. Durability

4.1. The durability of the wiper assembly shall be declared by the seller and shall not be less than 1,500,000 cycles for the complete wiper, and not less than 500,000 cycles for the blade element made of rubber.

##### 5. Chemical Resistance

5.1. The rubber element of the wiper shall not be affected by 50 per cent methyl or isopropyl alcohol when dipped in it for a period of five minutes.

##### 6. Plating

6.1. All the exposed metallic surfaces of the wipers shall be plated with nickel or chromium. The adhesion of the plating shall be checked by the following test:

###### 6.1.1. *Test*

The plated surface shall be rubbed 50 times with a copper coil held edgewise by applying moderate pressure. After rubbing, the plating shall not flake off.

6.2. The thickness of the plating shall be not less than 0.04 mm.

**7. General**

7.1. The wiper assembly and its parts shall be free from manufacturing defects. The workmanship and finish shall be as per the best trade practice.

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